TFT LCD Tentative Specification

MODEL NO.: N170C1 - L01

Customer : _____

Approved by : _____

Note :

Liquid Crystal Display Division	
QRA Division.	OA Head Division.
Approval	Approval
陳 94.2.17 永一	94.2.17 添仁

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REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 0.0	Feb. 16,'05	All	All	Tentative Specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

N170C1 - L01 is a 17.0" TFT Liquid Crystal Display module with two CCFLs Backlight unit and 30 pins LVDS interface. This module supports 1440 x 900 Wide-XGA mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The inverter module for Backlight is not built in.

1.2 FEATURES

- Thin and High Brightness
- WXGA (1440 x 900 pixels) resolution
- DE only mode
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 2 pixel/clock
- 2 CCFLs

1.3 APPLICATION

- TFT LCD Notebook

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	367.2 (H) x 229.5 (V) (17.0" diagonal)	mm	(1)
Bezel Opening Area	371.2 (H) x 233.5 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1440 x R.G.B. x 900	pixel	-
Pixel Pitch	0.255 (H) x 0.255 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	Hard coating (2H), Glare Type	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	381.7	382.2	382.7	mm	(1)
	Vertical (V)	246.3	246.8	247.3	mm	
	Depth (D)	---	9.7~8.3	10.0~8.6	mm	
Weight		---	970	1000	g	-

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Storage Humidity	H_{ST}	5	95		
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Operating Humidity	H_{OP}	5	95		
Shock (Non-Operating)	H_{ST}	-	200	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.5	G	(4), (5)

Note (1) Temperature and relative humidity range is shown below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

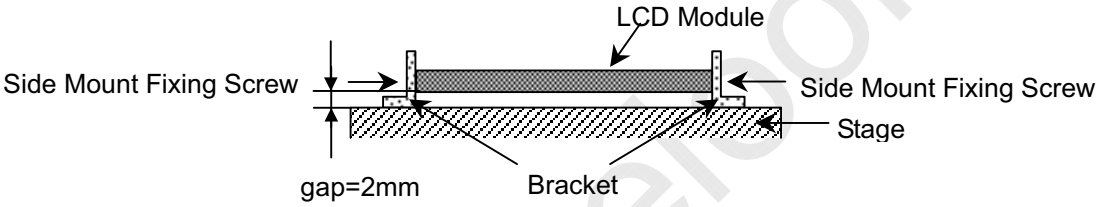
(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The ambient temperature means the temperature of panel surface.

Note (3) 2ms, half sine wave, 1 times for ± X, ± Y, ± Z.

Note (4) 10 ~ 200 Hz, 30 min/cycle, 1cycles for each X, Y, Z axis. The fixing condition is shown as below:



Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V_{CC}	-0.3	+4.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	V_{CC}+0.3	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_L	(705)	(855)	V_{RMS}	(1), (2), I_L = 6.0 mA
Lamp Current	I_L	(3.0)	(7.0)	mA_{RMS}	(1), (2)
Lamp Frequency	F_L	(40)	(80)	KHz	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for lamp (Refer to 3.2 for further information).

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

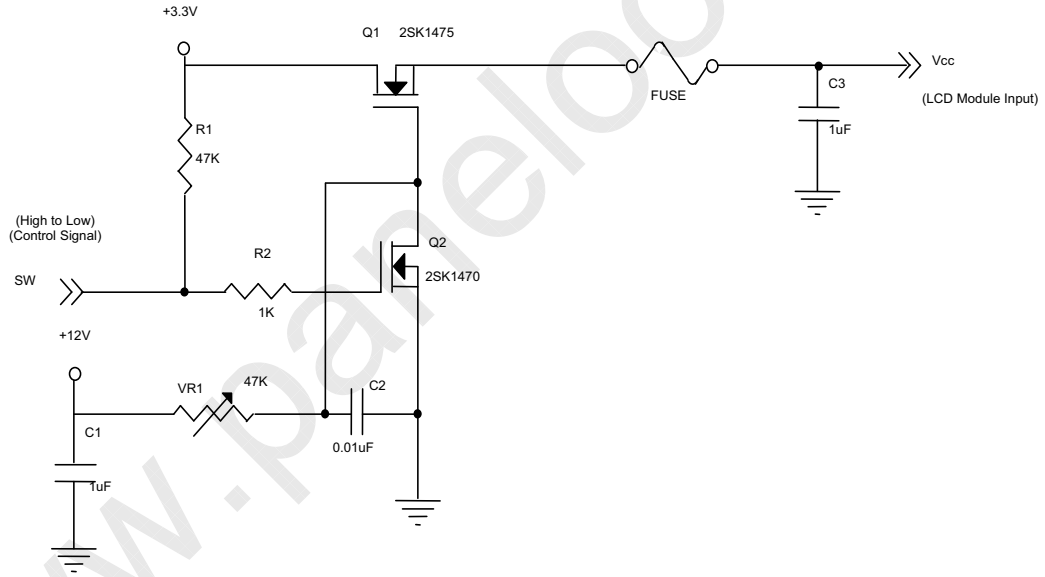
Ta = 25 ± 2 ºC

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	3.0	3.3	3.6	V	-
Ripple Voltage		V_{RP}		50		mV	-
Rush Current		I_{RUSH}			TBD	A	(2)
Power Supply Current	White	Lcc		TBD		mA	(3)a
	Black			TBD		mA	(3)b
Logical Input Voltage	"H" Level	V_{IL}			+100	mV	-
	"L" Level	V_{IH}	-100			mV	-
Terminating Resistor		R_T		100		Ohm	
Power per EBL WG		P_{EBL}	-	TBD	-	W	(4)

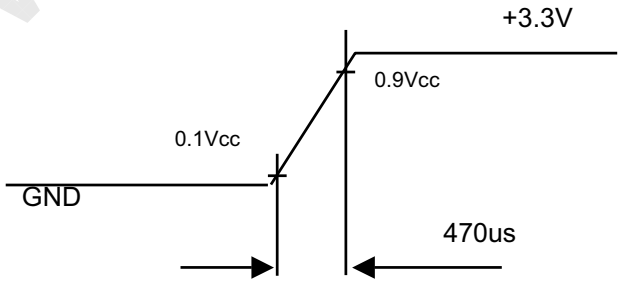
Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:

:



Vcc rising time is 470us



Note (3) The specified power supply current is under the conditions at Vcc = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

Active Area

b. Black Pattern

Active Area

Note (4) The specified power are the sum of LCD panel electronics input power and the inverter input power. Test conditions are as follows.

(a) Vcc = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz,

(b) The pattern used is a black and white 32 x 36 checkerboard, slide #100 from the VESA file "Flat Panel Display Monitor Setup Patterns", FPDMSU.ppt.

(c) Luminance: 60 nits.

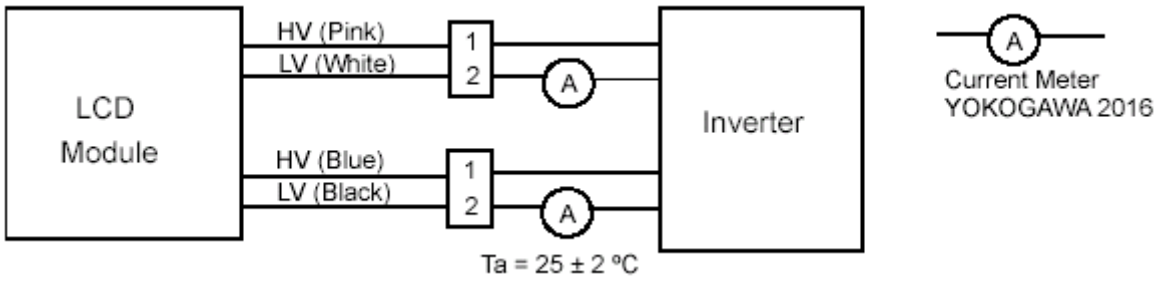
(d) The inverter used is provided from _____. Please contact them for detail information. CMO doesn't provide the inverter in this product.

3.2 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V_L	(705)	(785)	(855)	V_{RMS}	I_L = 6.0 mA
Lamp Current	I_L	3.0	6.0	7.0	mA_{RMS}	(1)
Lamp Turn On Voltage	V_S			(1250) (25 °C)	V_{RMS}	(2)
				(1500) (0 °C)	V_{RMS}	(2)
Operating Frequency	F_L	40		80	KHz	(3)
Lamp Life Time	L_{BL}	(10,000)			Hrs	(5)
Power Consumption	P_L		(4.7)		W	(4), I_L = (6.0) mA

Note (1) Lamp current is measured by utilizing a high frequency current meter as shown below:



Note (2) The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may produce interference with horizontal synchronous frequency from the display, and this may cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (4) $P_L = I_L \times V_L$

Note (5) The lifetime of lamp can be defined as the time in which it continues to operate under the condition Ta = 25 ±2 °C and I_L = 6.0 mArms until one of the following events occurs:

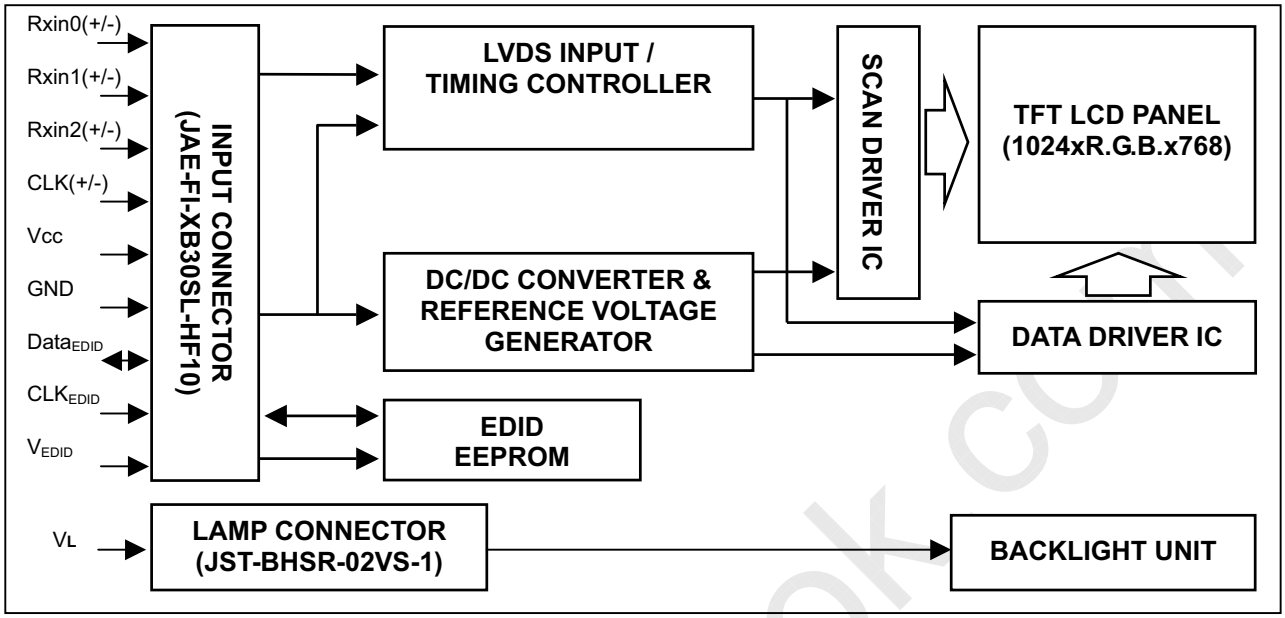
(a) When the brightness becomes or lower than 50% of its original value.

(b) When the effective ignition length becomes or lower than 80% of its original value. (Effective ignition length is defined as an area that has less than 70% brightness compared to the brightness in the center point.)

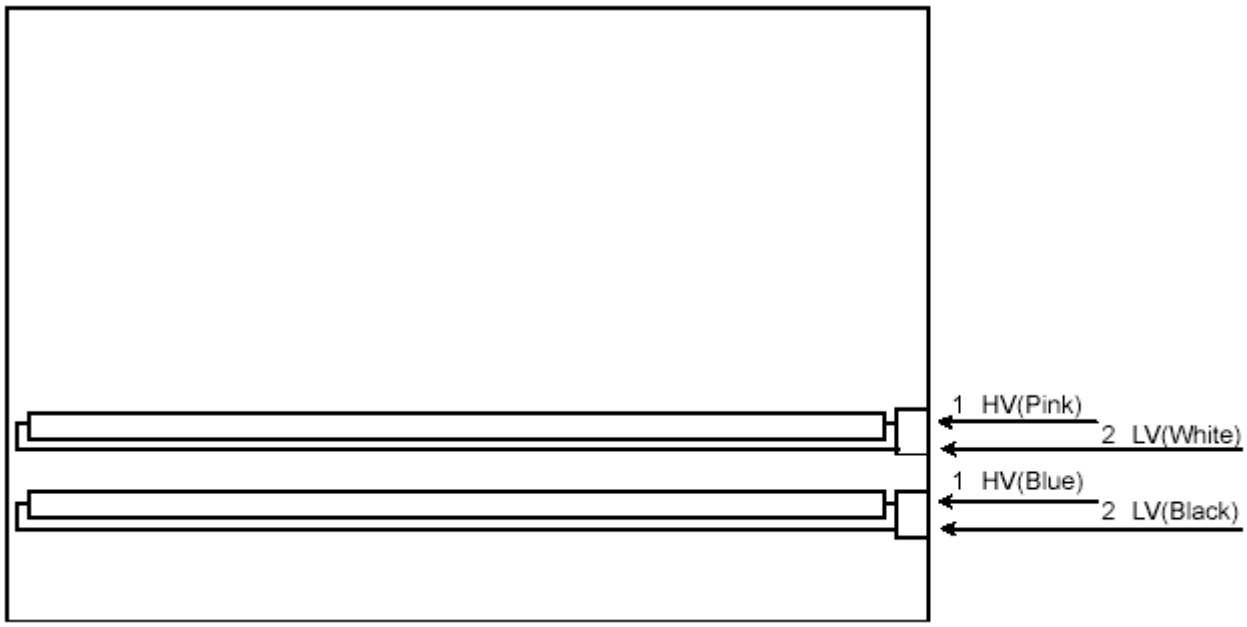
Note (6) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid generating too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



4.2 BACKLIGHT UNIT



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin	Symbol	Description	Polarity	Remark
1	Vss	Ground		
2	Vcc	Power Supply +3.3 V (typical)		
3	Vcc	Power Supply +3.3 V (typical)		
4	V_{EDID}	DDC 3.3V Power		
5	NC	Non-Connection		
6	CLK_{EDID}	DDC Clock		
7	$DATA_{EDID}$	DDC Data		-
8	RxE0-	LVDS Differential Data Input (Even)	Negative	R0~R5,G0
9	RxE0+	LVDS Differential Data Input (Even)	Positive	-
10	Vss	Ground		
11	RxE1-	LVDS Differential Data Input (Even)	Negative	G1~G5,B0,B1
12	RxE1+	LVDS Differential Data Input (Even)	Positive	-
13	Vss	Ground		
14	RxE2-	LVDS Differential Data Input (Even)	Negative	B2~B5,DE,Hsync,Vsync
15	RxE2+	LVDS Differential Data Input (Even)	Positive	
16	Vss	Ground		
17	RXEC-	LVDS Clock Data Input (Even)	Negative	LVDS Level
18	RXEC+	LVDS Clock Data Input (Even)	Positive	
19	Vss	Ground		
20	RXO0-	LVDS Differential Data Input (Odd)		
21	RXO0+	LVDS Differential Data Input (Odd)		
22	Vss	Ground		
23	RXO1-	LVDS Differential Data Input (Odd)		
24	RXO1+	LVDS Differential Data Input (Odd)		
25	Vss	Ground		
26	RXO2-	LVDS Differential Data Input (Odd)		
27	RXO2+	LVDS Differential Data Input (Odd)		
28	Vss	Ground		
29	RXOC-	LVDS Clock Data Input (Odd)		
30	RXOC+	LVDS Clock Data Input (Odd)		

Note (1) Connector Part No.: JAE-FI-XB30SL-HF10 or equivalent

Note (2) User's connector Part No: JAE-FI-X30C2L or equivalent

Note (3) The first pixel is even.

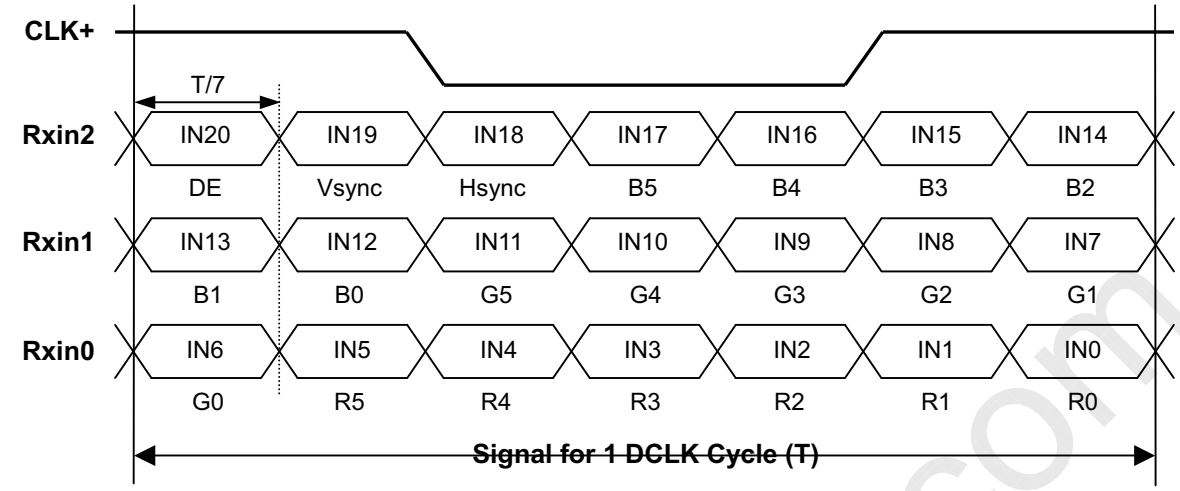
5.2 BACKLIGHT UNIT

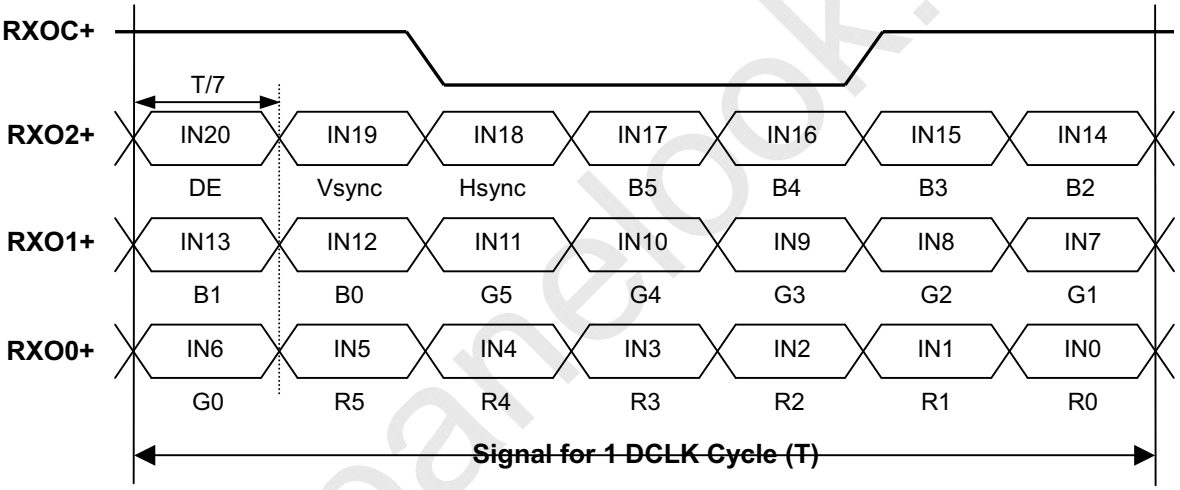
Pin	Symbol	Description	Color
1	HV	High Voltage	Pink
2	LV	Ground	White
1	HV	High Voltage	Blue
2	LV	Ground	Black

Note (1) Connector Part No.: JST-BHSR-02VS-1 or equivalent

Note (2) User's connector Part No.: JST-SM02B-BHSS-1-TB or equivalent

5.3 TIMING DIAGRAM OF LVDS INPUT SIGNAL





5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

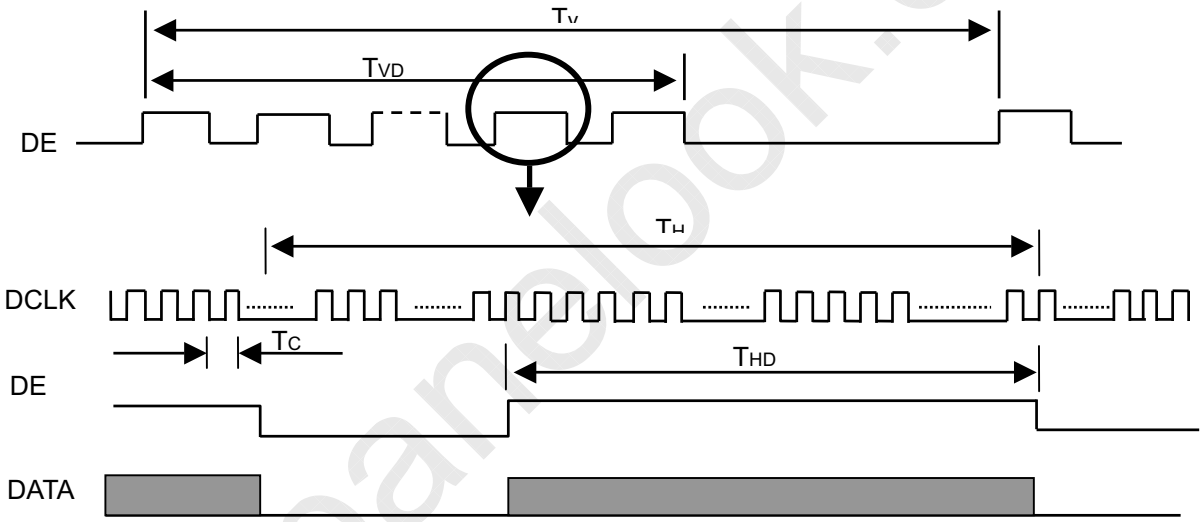
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

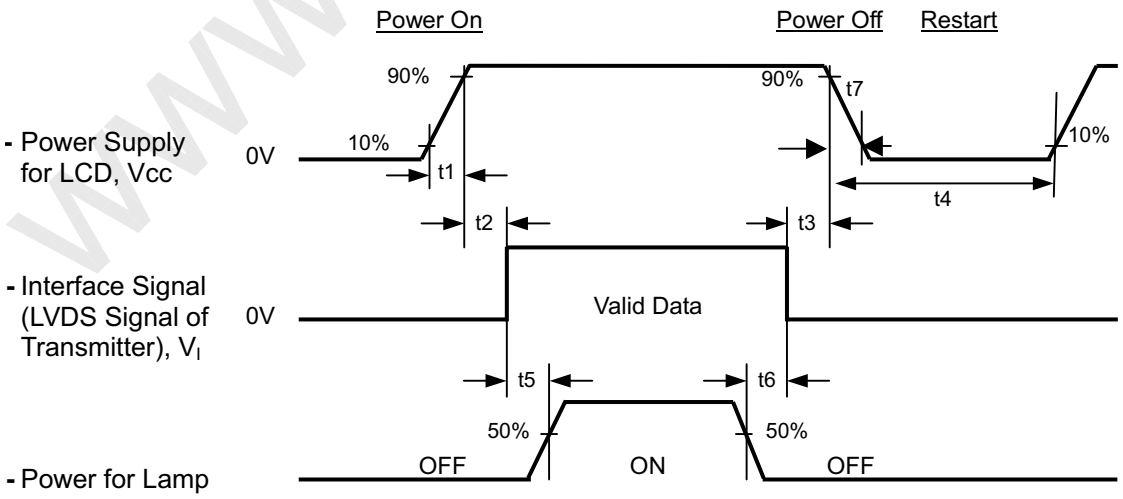
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc		TBD		MHz	-
DE	Vertical Total Time	TV		TBD		TH	-
	Vertical Active Display Period	TVD	900	900	900	TH	-
	Horizontal Total Time	TH		TBD		Tc	-
	Horizontal Active Display Period	THD	1440	1440	1440	Tc	-

Note (1) Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE



Timing Specifications:

470us < t1 ≦ 10 ms

0 < t2 ≦ 50 ms

0 < t3 ≦ 50 ms

t4 ≧ TBD ms

t5 ≧ TBD ms

t6 ≧ TBD ms

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Sometimes some slight noise shows when LCD is turned off (even backlight is already off). To avoid this phenomenon, we suggest that the Vcc falling time had better to follow

t7 ≧ 5 msec

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I_L	(6.0)	mA
Inverter Driving Frequency	F_L	(60)	KHz
Inverter	TBD		

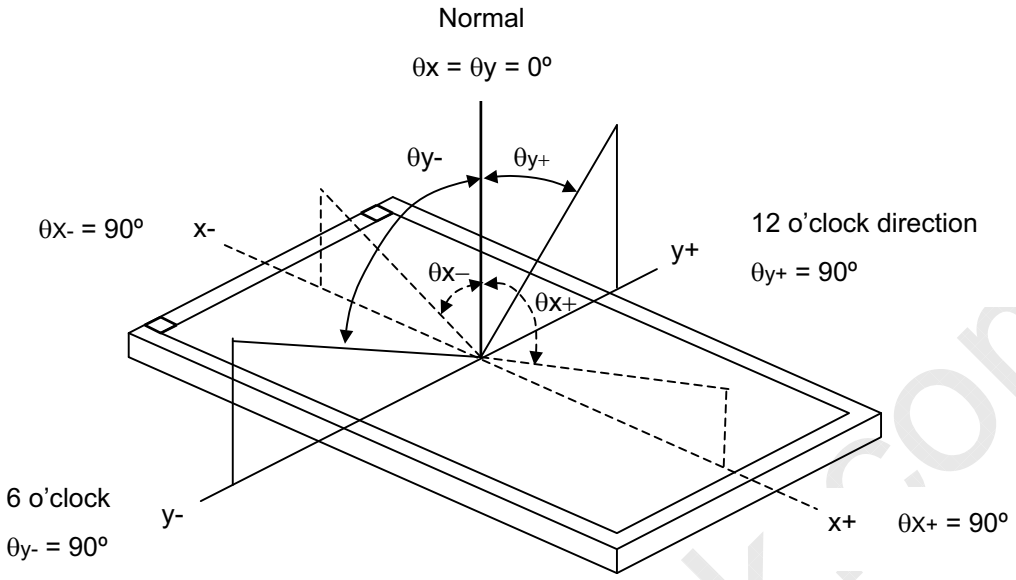
The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

7.2 OPTICAL SPECIFICATIONS

7.2 OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0° Viewing Normal Angle (CS-1000T)	250	400		-	(2), (6)
Response Time		T_R		-	4	10	ms	(3)
		T_F		-	12	20	ms	
Central Luminance of White		L_5		(420)	(500)		cd/m^2	(4), (6)
White Variation		δW		75			-	(6), (7)
Cross Talk		CT		-		4.0	%	(5), (6)
Color Chromaticity	Red	Rx		TYP -0.03	TBD	TYP +0.03	-	(1), (6)
		Ry			TBD		-	
	Green	Gx			TBD		-	
		Gy			TBD		-	
	Blue	Bx			TBD		-	
		By			TBD		-	
	White	Wx			0.313		-	
		Wy			0.329		-	
Viewing Angle	Horizontal	θ_x+	CR≥10		70		Deg.	
		θ_x-			70			
	Vertical	θ_Y+			60			
		θ_Y-			60			

Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

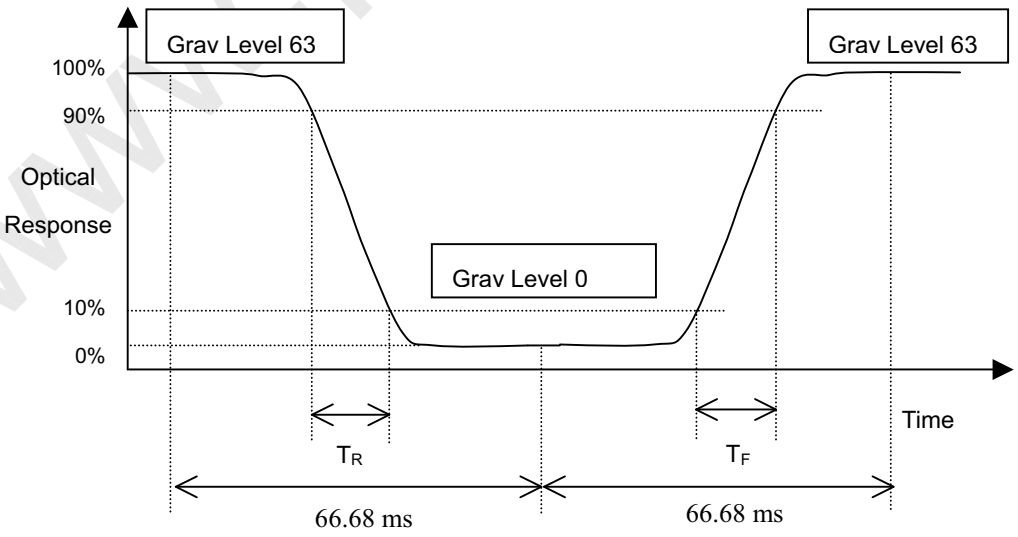
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (7).

Note (3) Definition of Response Time (T_R, T_F):



Note (4) Definition of Central Luminance of White (L_5):

Measure the luminance of gray level 63 at point X

$L_5 = L(5)$

L (x) is corresponding to the luminance of the point X at Figure in Note (7).

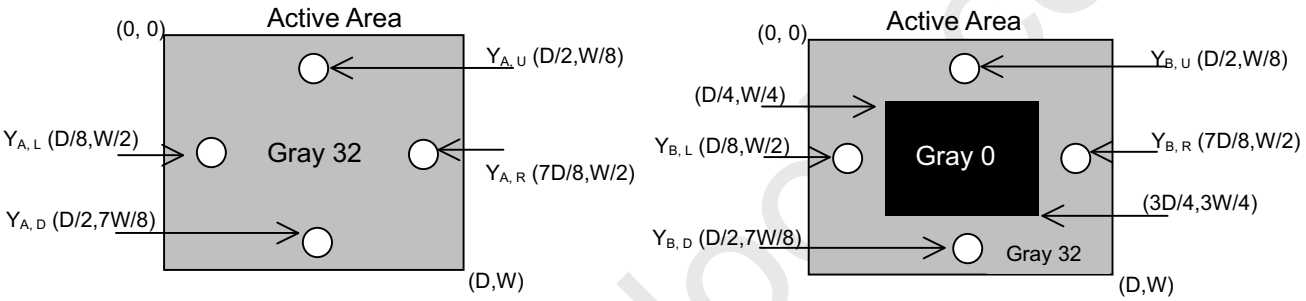
Note (5) Definition of Cross Talk (CT):

$CT = | Y_B - Y_A | / Y_A \times 100\ (\%)$

Where:

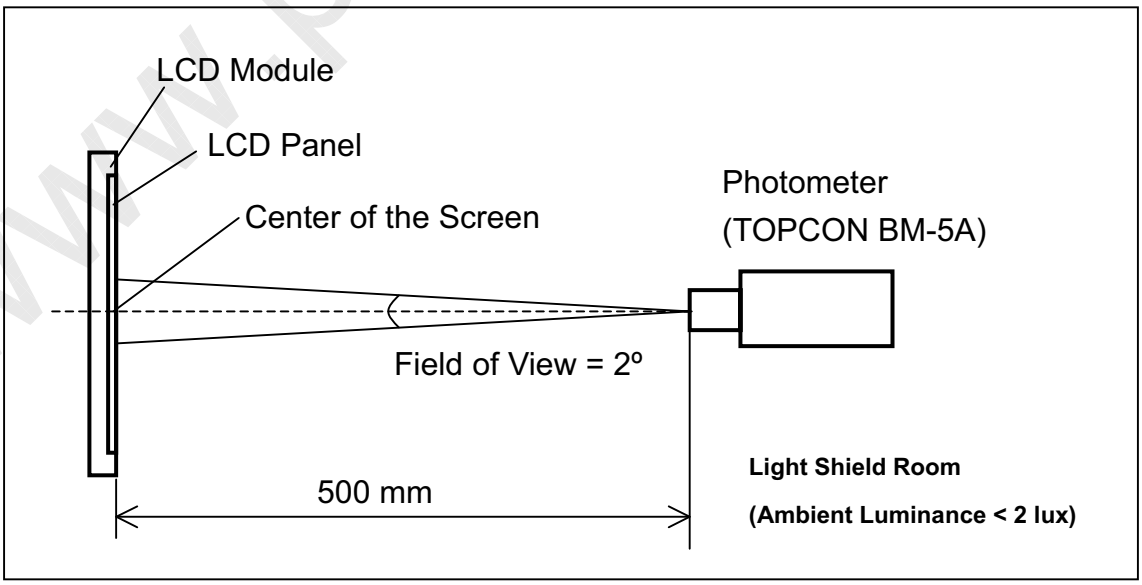
Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m^2)



Note (6) Measurement Setup:

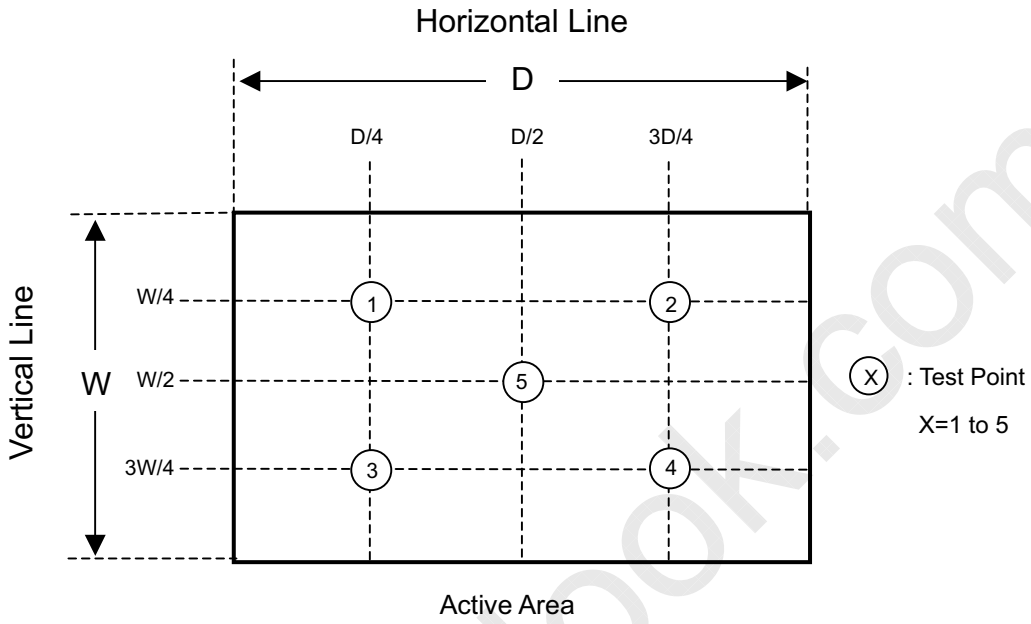
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



8. PRECAUTIONS

8.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.

(4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.

(9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(10) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly, and the starting voltage of CCFL will be higher than room temperature.

8.2 SAFETY PRECAUTIONS

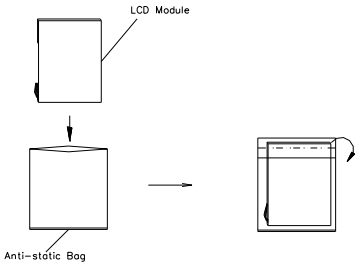
(1) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the Backlight unit.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

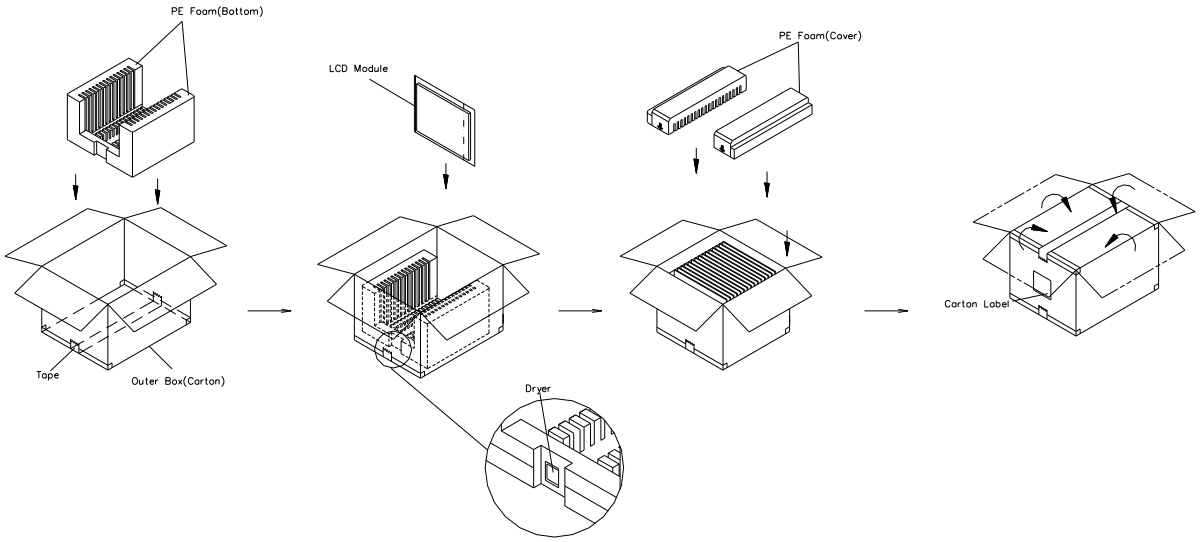
(3) After the module's end of life, it is not harmful in case of normal operation and storage.

9. PACKING

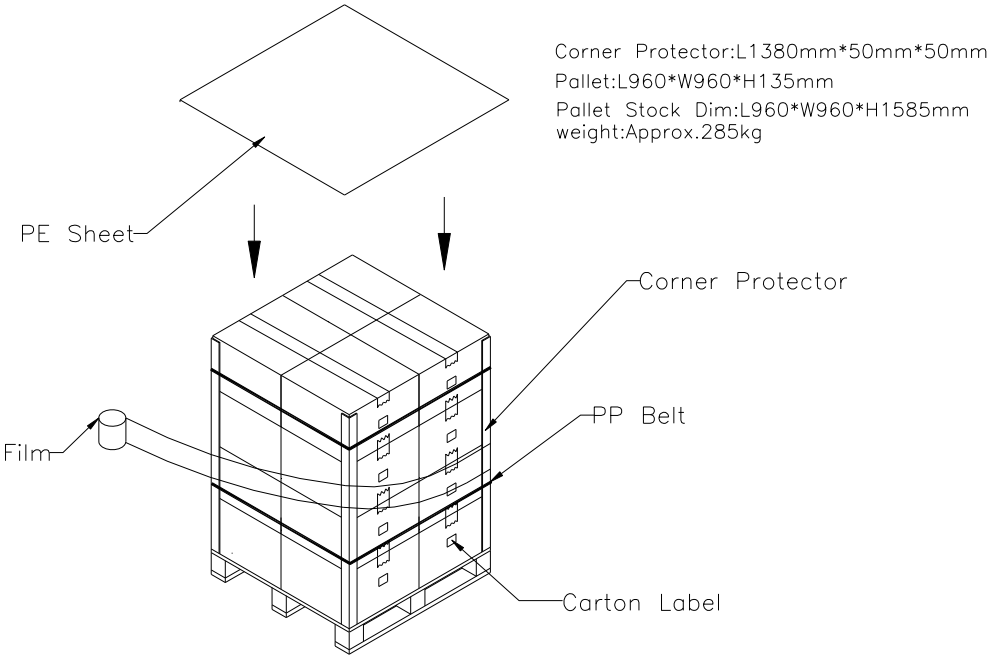
9.1 CARTON



Box Dimensions: 475(L)x475(W)x360(H)mm
Weight : Approx.16.5kg(15 module.per.1 box)



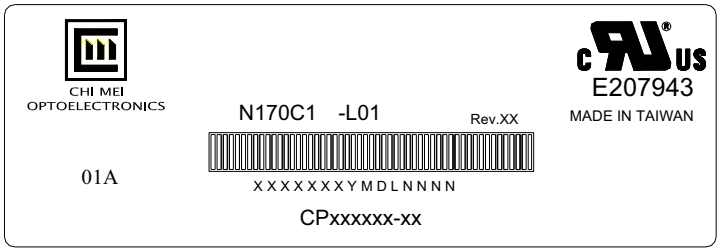
9.2 PALLET



10. DEFINITION OF LABELS

10.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: N170C1 - L01

(b) Revision: Rev. XX, for example: A1, …, C1, C2 …etc.

(c) Serial ID: X X X X X X Y M D X N N N N

- Serial No.
- CMO Internal Use
- Year, Month, Date
- CMO Internal Use
- Revision
- CMO Internal Use

(d) Customer Internal Product Code : CPxxxxxx-xx

(e) Customer Internal Revision : XXX, for example: 01A, 02A …etc

Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2001~2009

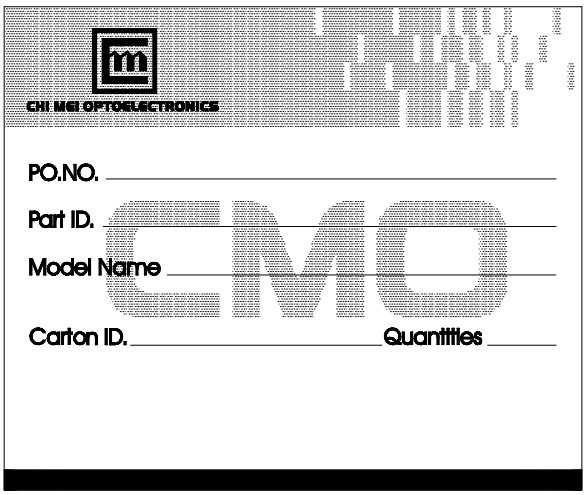
Month: 1~9, A~C, for Jan. ~ Dec.

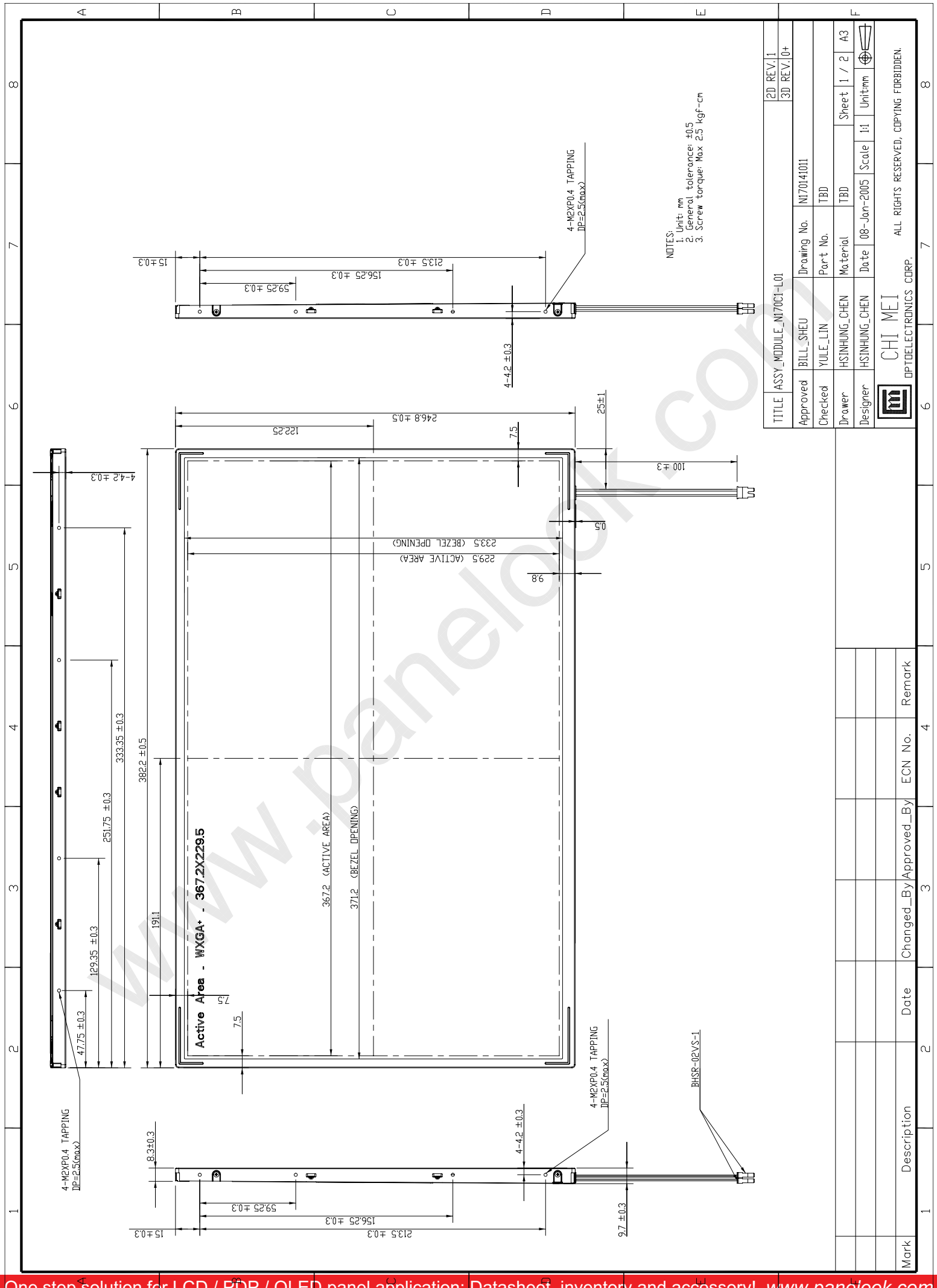
Day: 1~9, A~Y, for 1st to 31st, exclude I , O and U

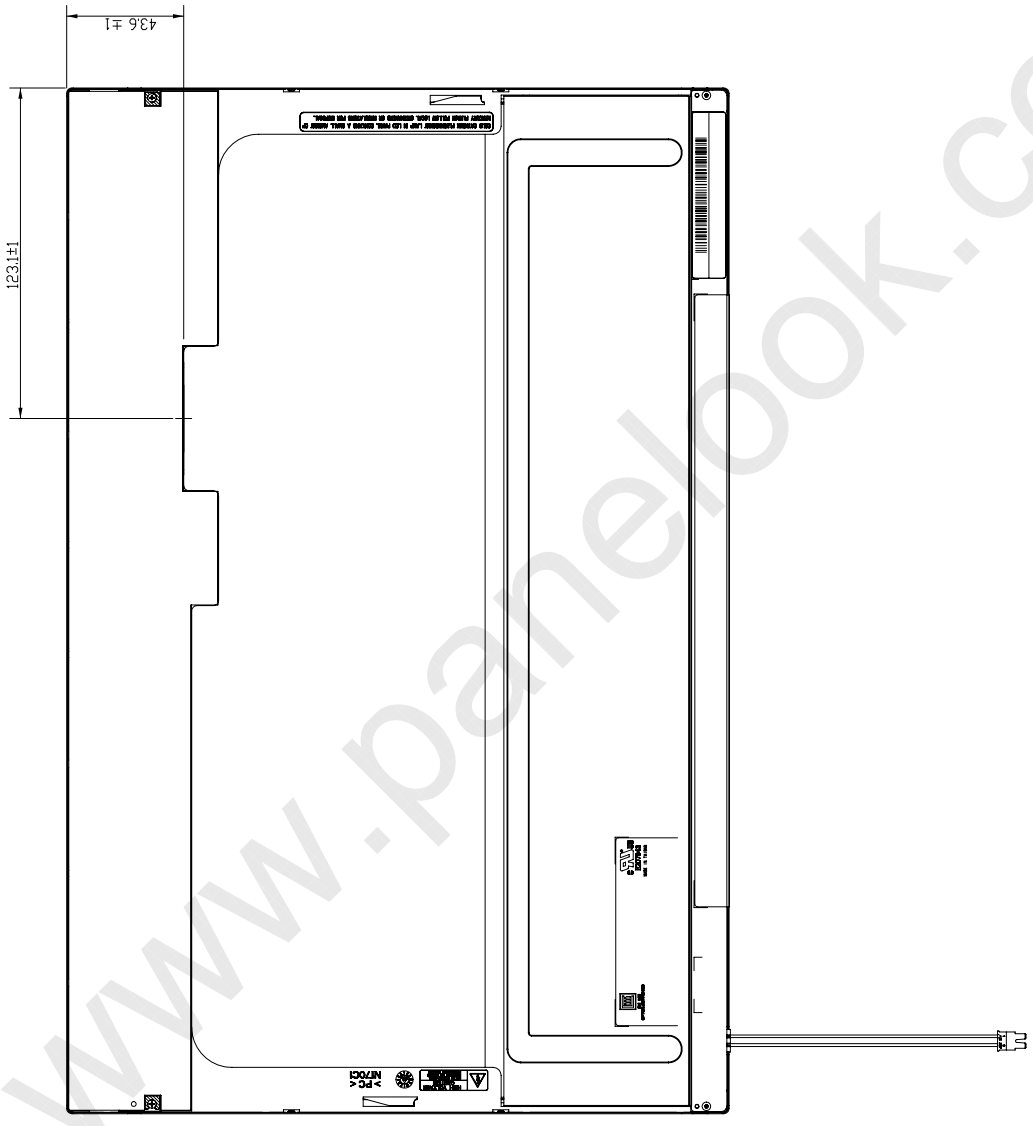
(b) Revision Code: cover all the change

(c) Serial No.: Manufacturing sequence of product

10.2 CARTON LABEL







TITLE	ASSY_MODULE_N170C1-L01
Approved	BILL_SHEU
Checked	YULE_LIN
Drawer	HSINHUNG_CHEN
Designer	HSINHUNG_CHEN

2D REV.	1
3D REV.	0+
Drawing No.	N170141011
Part No.	TBD
Material	TBD
Date	08-Jan-2005
Scale	1:1
Sheet	2 / 2
	A3
	Unit:mm

CHI MEI OPTOELECTRONICS CORP.

Mark	Description	Date	Changed_By	Approved_By	ECN No.	Remark